

Discoverability of Regulatory Rulebooks

Use of W3C Semantic Web standards to publish US
and EU regulatory rulebooks

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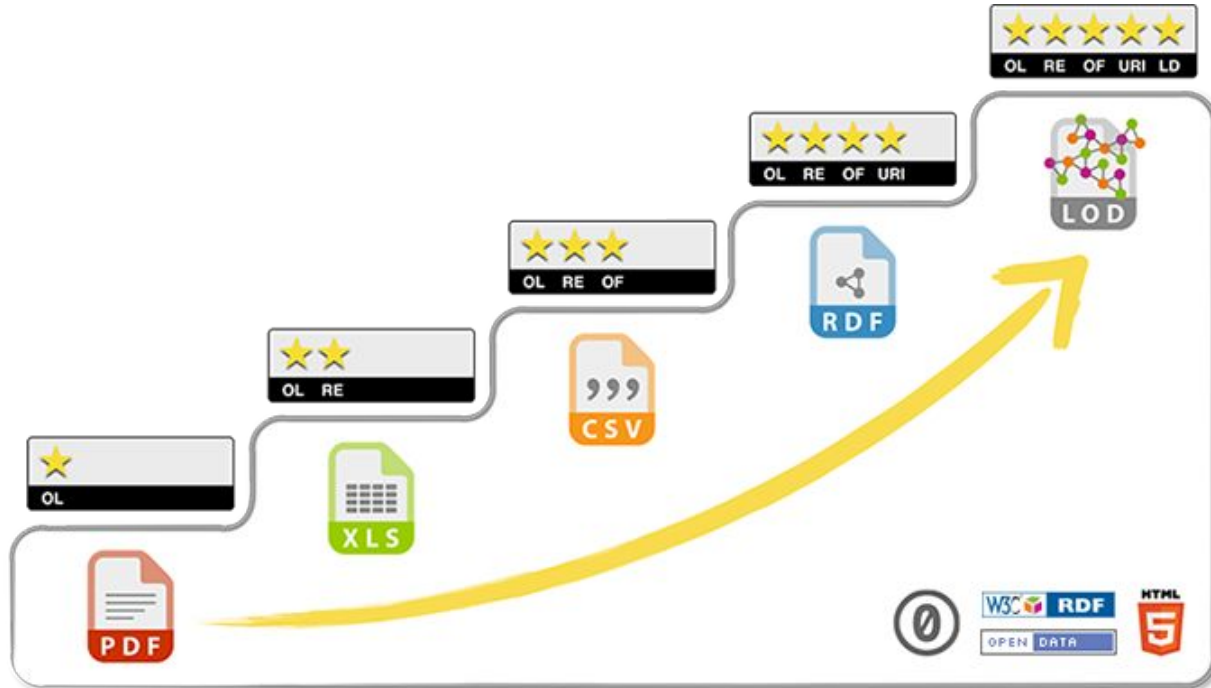
Model-Driven Machine Executable Regulation

- Increasing interest from regulators and regulated firms
- Main beneficiaries are regulated firms, investors, and regulators
- Target state of publishing executable regulation
- Initial step of making content of rulebooks and regulatory communications discoverable

Discoverability of Data on the Web

- W3C Linked Data standards such as RDF, RDFS, OWL and SPARQL
- Existing metadata and thesaurus standards such as DC, SKOS
- Newer ones to help with discoverability of datasets such as CSVW and DCAT

5-Star Linked Open Data



HM Land Registry (UK)

HM Land Registry

HM Land Registry Open Data
UK House Price Index Price Paid Data Standard reports SPARQL Query

BETA This is a new service – your feedback will help us to improve it.

EXAMPLE QUERIES
UK house price index by location all UKHPI for a place and month UKHPI in a date range transactions in a postcode

PREFIXES rdf rdfs owl xsd sr ukhpi lrppi skos lrcommon

```
1 prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
2 prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#>
3 prefix owl: <http://www.w3.org/2002/07/owl#>
4 prefix xsd: <http://www.w3.org/2001/XMLSchema#>
5 prefix sr: <http://data.ordnancesurvey.co.uk/ontology/spatialrelations/>
6 prefix ukhpi: <http://landregistry.data.gov.uk/def/ukhpi/>
7 prefix lrppi: <http://landregistry.data.gov.uk/def/lrppi/>
8 prefix skos: <http://www.w3.org/2004/03/skos/core#>
9 prefix lrcommon: <http://landregistry.data.gov.uk/def/common/>
10
11 # Returns the Price Paid data from the default graph for each transaction record having
12 # an address with the given postcode.
13 # The postcode to query is set using SPARQL 1.1's 'values' clause
14
15 SELECT ?transx ?category ?postcode ?amount ?date
16 WHERE
17 {
18   VALUES ?postcode ("PL6 8RU""xsd:string)
```

Select endpoint: /landregistry/query

RESULTS: table perform query

32 results in 0 min 0.036 s

Show 10 entries Search:

transx	category	postcode
http://landregistry.data.gov.uk/data/ppi/transaction/0721D651-B0D0-45F0-A8B5-35196E2854DC/current	lrppi:standardPricePaidTransaction	"PL6 8RU"
http://landregistry.data.gov.uk/data/ppi/transaction/08A70FC7-A8A9-4A92-9AFF-FC3C39049E1A/current	lrppi:standardPricePaidTransaction	"PL6 8RU"

W3C SPARQL to retrieve the data

HM Land Registry (UK)

The screenshot displays the HM Land Registry's Linked Data API interface. The main window shows search results for a transaction with ID 0721D651-B0D0-45F0-A8B5-35196E2854DC. The results are presented in a structured, key-value format with search icons for each field.

transaction id	0721D651-B0D0-45F0-A8B5-35196E2854DC
new build	<input checked="" type="checkbox"/>
transaction date	08/11/2002
price paid	149950
type	TransactionRecord
estate type	Freehold
has transaction	0721D651-B0D0-45F0-A8B5-35196E2854DC
property address	72639676477622564680988aa8070ec23a86
county	CITY OF PLYMOUTH
district	CITY OF PLYMOUTH
locality	PLYMOUTH
paon	29
postcode	PL6 8RU
street	PATTINSON DRIVE
town	PLYMOUTH
type	BS7666Address
property type	semi-detached
record status	Add
transaction category	Standard price paid transaction

On the left, there is a sidebar with a SPARQL query editor and a 'Select endpoint' button. Below the query editor, it shows '32 results in 0 min 0.036 s' and a 'Show 10 entries' option. The URL in the browser is `http://landregistry.data.gov.uk/data/ppi/transaction/0721D651-B0D0-45F0-A8B5-35196E2854DC/current`.

URIs to identify transactions, so others can link to them

Link to SKOS Concept to identify category

HM Land Registry (UK)

The image shows a sequence of browser windows from the HM Land Registry website. The first window shows a search interface with a SPARQL query for finding transactions in a specific area. The second window shows the search results for a transaction with ID 072. The third window shows the 'Standard price paid transaction' page, which includes a table of properties and a 'Viewer' section. A callout box points to the 'top concept of' field in the table, which is 'transactionCategoryConceptScheme', and contains the text 'Link to SKOS Scheme'.

SPARQL Query:

```
1 prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
2 prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#>
3 prefix owl: <http://www.w3.org/2002/07/owl#>
4 prefix xsd: <http://www.w3.org/2001/XMLSchema#>
5 prefix ar: <http://www.ontologydesignpatterns.org/ont/propart/arbitrary#>
6 prefix ukhpi: <http://www.landregistry.gov.uk/ontology/ukhpi#>
7 prefix lpppi: <http://www.landregistry.gov.uk/ontology/lpppi#>
8 prefix skos: <http://www.w3.org/2004/02/skos/core#>
9 prefix lccommon: <http://www.landregistry.gov.uk/ontology/lccommon#>
10
11 # Returns the Price Paid for a property
12 # an address with a postcode
13 # The postcode to search for
14
15 SELECT ?trans ?cat
16 WHERE {
17   ?trans a ukhpi:StandardPricePaidTransaction
18   VALUES ?postcode
```

Transaction Properties:

transaction id	072
new build	<input checked="" type="checkbox"/>
transaction date	08/1
price paid	1491
type	Tran
estate type	Free
has transaction	072
property address	7036
cou	
dist	
loc	
pao	
pos	
stre	
tow	
typ	
property type	sem
record status	Add
transaction category	Star

Standard price paid transaction Properties:

label	Standard price paid transaction
transaction category notation	A
notation	A
skos_definition	Single residential property sold for full market value to private individual
type	TransactionCategory
top concept of	transactionCategoryConceptScheme

Viewer:

```
PREFIX ppi: <http://landregistry.data.gov.uk/def/ppi/>
DESCRIBE
ppi:standardPricePaidTransaction
```

HM Land Registry (UK)



Regulatory Rulebooks on the Web

- Existing metadata and thesaurus standards such as DC, SKOS
- Existing legislation ontologies such as ELI, schema.org
- Existing schemas such as DLXS

5-Star Linked Regulatory Rulebooks

- Reuse the original 5-star ranking
- Axis of granularity (none, document, section, paragraph, sub-paragraph)
- Axis of semantic richness (none, glossary, taxonomy, thesaurus, ontology)

ESMA (EU Agency)

The screenshot shows the EUR-Lex website interface. At the top, there is a navigation bar with the EUR-Lex logo and the text "Access to European Union law". Below this is a search bar and a menu. The main content area displays the document "Document 32017R0583". The document title is "Commission Delegated Regulation (EU) 2017/583 of 14 July 2016 supplementing Regulation (EU) No 600/2014 of the European Parliament and of the Council on markets in financial instruments with regard to regulatory technical standards on trading venues and investment firms in respect of bonds, structured finance products, emission allowances and derivatives (Text with EEA relevance.)". The document is published in the Official Journal L 87, 31.3.2017, p. 229-349. The document is available in multiple languages, including BG, ES, CS, DA, DE, ET, EL, EN, FR, GA, HR, IT, LV, LT, HU, MT, NL, PL, PT, RO, SK, SL, FI, and SV. The document is available in HTML, PDF, and Official Journal formats. The document is in force and has a legal value. The document is available in English (en) and other languages.

EUR-Lex is published by the Publication office of the EU

URIs to identify the regulation

ESMA (EU Agency)

The screenshot displays the EUR-Lex website interface on the left and its source code on the right. The website shows document information for a regulation, including options to save to My Items, download notices, and follow the document. The source code is an RDF/XML snippet with several annotations. Two callout boxes highlight specific parts of the code: one points to the 'eli:is_about' property and another points to the 'eli:in_force' property.

```
57 <meta about="http://data.europa.eu/eli/reg_del/2017/583/oj" property="eli:passed_by"
58 resource="http://publications.europa.eu/resource/authority/corporate-body/FISMA"/>
59 <meta about="http://data.europa.eu/eli/reg_del/2017/583/oj"
60 property="eli:responsibility_of"
61 content="FISMA"/>
62 <meta about="http://data.europa.eu/eli/reg_del/2017/583/oj" property="eli:is_about"
63 resource="http://eurovoc.europa.eu/2098"/>
64 <meta about="http://data.europa.eu/eli/reg_del/2017/583/oj" property="eli:is_about"
65 resource="http://eurovoc.europa.eu/4491"/>
66 <meta about="http://data.europa.eu/eli/reg_del/2017/583/oj" property="eli:is_about"
67 resource="http://eurovoc.europa.eu/560"/>
68 <meta about="http://data.europa.eu/eli/reg_del/2017/583/oj" property="eli:is_about"
69 resource="http://eurovoc.europa.eu/248"/>
70 <meta about="http://data.europa.eu/eli/reg_del/2017/583/oj" property="eli:is_about"
71 resource="http://eurovoc.europa.eu/5235"/>
72 <meta about="http://data.europa.eu/eli/reg_del/2017/583/oj" property="eli:is_about"
73 resource="http://eurovoc.europa.eu/434966"/>
74 <meta about="http://data.europa.eu/eli/reg_del/2017/583/oj" property="eli:is_about"
75 resource="http://eurovoc.europa.eu/4195"/>
76 <meta about="http://data.europa.eu/eli/reg_del/2017/583/oj" property="eli:is_about"
77 resource="http://eurovoc.europa.eu/1459"/>
78 <meta about="http://data.europa.eu/eli/reg_del/2017/583/oj"
79 property="eli:date_document"
80 content="2016-07-14"
81 datatype="xsd:date"/>
82 <meta about="http://data.europa.eu/eli/reg_del/2017/583/oj"
83 property="eli:date_publication"
84 content="2017-03-31"
85 datatype="xsd:date"/>
86 <meta about="http://data.europa.eu/eli/reg_del/2017/583/oj" property="eli:in_force"
87 resource="http://data.europa.eu/eli/ontology#InForce-inForce"/>
88 <meta about="http://data.europa.eu/eli/reg_del/2017/583/oj"
89 property="eli:first_date_entry_in_force"
90 content="2017-04-20"/>
```

Use ELI ontology

Links to SKOS Concepts that this regulation is about

ESMA (EU Agency)

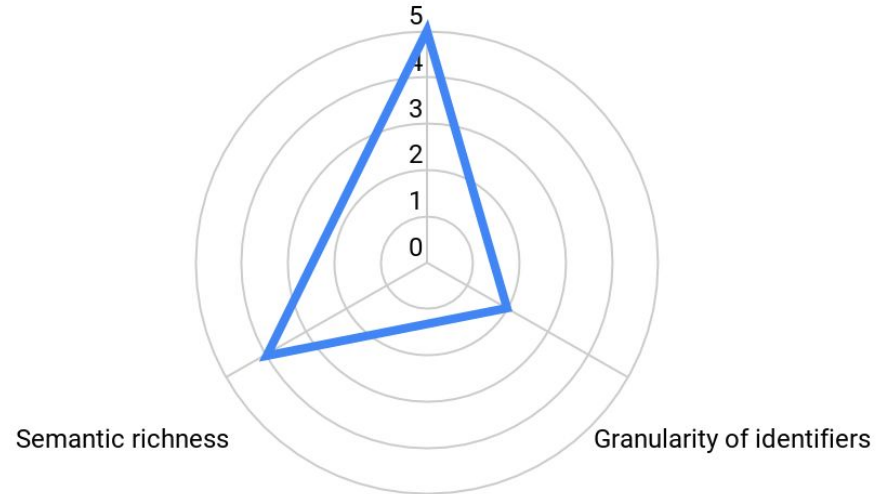
The screenshot displays the EUR-Lex website interface on the left and its source code on the right. The source code is an RDF/XML document defining a SKOS concept for 'financial bond'. A callout box points to the SKOS scheme URIs in the code.

```
57 <meta about="http://data.eu
58 resource="http://publ
59 <meta about="http://data.eu
60 property="eli:respons
61 content="FISMA"/>
62 <meta about="http://data.eu
63 resource="http://euro
64 <meta about="http://data.eu
65 resource="http://euro
66 <meta about="http://data.eu
67 resource="http://euro
68 <meta about="http://data.eu
69 resource="http://euro
70 <meta about="http://data.eu
71 resource="http://euro
72 <meta about="http://data.eu
73 resource="http://euro
74 <meta about="http://data.eu
75 resource="http://euro
76 <meta about="http://data.eu
77 resource="http://euro
78 <meta about="http://data.eu
79 property="eli:date_do
80 content="2016-07-14"
81 datatype="xsd:date"/>
82 <meta about="http://data.eu
83 property="eli:date pu
84 content="2017-03-31"
85 datatype="xsd:date"/>
86 <meta about="http://data.eu
87 resource="http://data
88 <meta about="http://data.eu
89 property="eli:first_d
90 content="2017-04-20"
91 </meta>
92 </meta>
93 </meta>
94 </meta>
95 </meta>
96 </meta>
97 </meta>
98 </meta>
99 </meta>
100 </meta>
```

Links to SKOS Scheme

ESMA (EU Agency)

5 Star Linked Data



CFTC (US Federal Agency)

Published daily by the Office of National Register

The screenshot shows the Federal Register website interface. At the top, there is a navigation bar with 'Sections', 'Browse', 'Search', 'Reader Aids', and 'My FR' menus. The main header features the 'FEDERAL REGISTER' logo and the text 'The Daily Journal of the United States Government'. Below this, a blue bar contains a 'Notice' icon. The main content area displays the title of the notice: 'Performance of Registration Functions by National Futures Association With Respect to Retail Foreign Exchange Dealers and Associated Persons'. Below the title, it states 'A Notice by the Commodity Futures Trading Commission on 09/10/2010'. The document is presented in a structured layout with two columns: 'PUBLISHED DOCUMENT' on the left and 'DOCUMENT DETAILS' on the right. The left column includes sections for 'AGENCY', 'ACTION', and 'SUMMARY'. The right column includes sections for 'Printed version', 'Publication Date', 'Agency', 'Document Type', and 'Document Citation'.

PUBLISHED DOCUMENT	DOCUMENT DETAILS
AGENCY: Commodity Futures Trading Commission	Printed version: PDF
ACTION: Notice and order	Publication Date: 09/10/2010
SUMMARY: The Commodity Futures Trading Commission ("Commission" or "CFTC") is authorizing the National Futures Association ("NFA"), effective September 10, 2010, to process and grant applications for initial registration, renewed registration and withdrawals of retail foreign exchange dealers ("RFEDs") and	Agency: Commodity Futures Trading Commission
	Document Type: Notice
	Document Citation: 75 FR 55310
	Page: 55310-55312 (3 pages)

CFTC (US Federal Agency)

Performance of Registration Functions by National Futures Association With Respect to Retail Foreign Exchange Dealers and Associated Persons

A Notice by the Commodity Futures Trading Commission on 09/10/2010

PUBLISHED DOCUMENT

AGENCY:
Commodity Futures Trading Commission

ACTION:
Notice and order

SUMMARY:
The Commodity Futures Trading Commission ("Commission") is authorizing the National Futures Association ("NFA"), effective September 10, 2010, to process and register with respect to retail foreign exchange dealers ("FEDs") and associated persons ("APs") eligible APs, make the registration in r AP.

ENHANCED CONTENT - DEVELOPER TOOLS

This document is available in the following developer friendly formats:

- JSON: Normalized attributes and metadata
- XML: Original full text XML
- MODS: Government Publishing Office metadata

More information and documentation can be found in our developer tools pages.

DOCUMENT DETAILS

Printed version: PDF

Document Type:
Notice

Document Citation:
75 FR 55310

Page:
55310-55312 (3)

Document Number:
2010-21726

DOCUMENT STATISTICS

Page views:
122
as of 04/03/2019 at 12:15 am EDT

URIs to identify documents

Also see API and schema documentation
<https://www.federalregister.gov/readers-aids/developer-resources>

CFTC (US Federal Agency)

Published annually by the Government Publication Office

Electronic Code of Federal Regulations
e-CFR data is current as of **April 1, 2019**

Title 17 → Chapter I → Part 1

Browse Next

Title 17: Commodity and Securities Exchanges

PART 1—GENERAL REGULATIONS UNDER THE COMMODITY EXCHANGE ACT

Contents

DEFINITIONS

- \$1.1 [Reserved]
- \$1.2 Liability of principal for act of agent.
- \$1.3 Definitions.
- \$1.4 Electronic signatures, acknowledgments and verifications.
- \$1.6 Anti-evasion.
- \$1.7 Books and records requirements for security-based swap agreements.
- \$1.8 Requests for interpretation of swaps, security-based swaps, and mixed swaps.
- \$1.9 Regulation of mixed swaps.

MINIMUM FINANCIAL AND RELATED REPORTING REQUIREMENTS

- \$1.10 Financial reports of futures commission merchants and introducing brokers.
- \$1.11 Risk Management Program for futures commission merchants.
- \$1.12 Maintenance of minimum financial requirements by futures commission merchants and introducing brokers.
- \$1.13 [Reserved]
- \$1.14 Risk assessment recordkeeping requirements for futures commission merchants.
- \$1.15 Risk assessment reporting requirements for futures commission merchants.
- \$1.16 Qualifications and reports of accountants.
- \$1.17 Minimum financial requirements for futures commission merchants and introducing brokers.

CFTC (US Federal Agency)

URIs don't look as stable, but they do identify elements of the document down to subsection level

Definitions are embedded with no unique identifiers or links to thesaurus

11.3 Definitions.

...used in the singular form in the rules and regulations in this chapter shall be deemed to import the plural and vice versa, as the context may require. The following terms, as used in the Commodity Exchange Act, or in the rules and regulations in this chapter, shall have the meanings hereby assigned to them, unless the context otherwise requires:

Agricultural commodity. This term means:

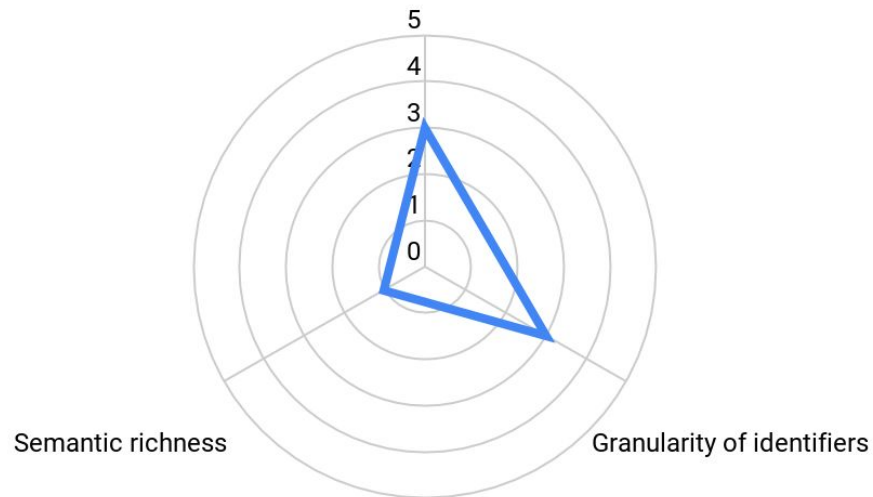
- (1) The following commodities specifically enumerated in the definition of a "commodity" found in section 1a of the Act: Wheat, cotton, rice, corn, oats, barley, rye, flaxseed, grain sorghums, mill feeds, butter, eggs, *Solanum tuberosum* (Irish potatoes), wool, wool tops, fats and oils (including lard, tallow, cottonseed oil, peanut oil, soybean oil and all other fats and oils), cottonseed meal, cottonseed, peanuts, soybeans, soybean meal, livestock, livestock products, and frozen concentrated orange juice, but not onions;
- (2) All other commodities that are, or once were, or are derived from, living organisms, including plant, animal and aquatic life, which are generally fungible, within their respective classes, and are used primarily for human food, shelter, animal feed or natural fiber;
- (3) Tobacco, products of horticulture, and such other commodities used or consumed by animals or humans as the Commission may by rule, regulation or order designate after notice and opportunity for hearing; and
- (4) Commodity-based indexes based wholly or principally on underlying agricultural commodities.

Associated person. This term means any natural person who is associated in any of the following capacities with:

- (1) A futures commission merchant as a partner, officer, or employee (or any natural person occupying a similar status or performing similar functions), in any capacity which involves (i) The solicitation or acceptance of customers' orders (other than in a clerical capacity) or (ii) the supervision of any person or persons so engaged;
- (2) An introducing broker as a partner, officer, employee, or agent (or any natural person occupying a similar status or performing similar functions), in any capacity which involves (i) The solicitation or acceptance of customers' orders (other than in a clerical capacity) or (ii) the supervision of any person or persons so engaged;
- (3) A commodity pool operator as a partner, officer, employee, consultant, or agent (or any natural person occupying a similar status or performing similar functions), in any capacity which involves (i) the solicitation of funds, securities, or property for a participation in a commodity pool or (ii) the supervision of any person or persons so engaged; or
- (4) A commodity trading advisor as a partner, officer, employee, consultant, or agent (or any natural person occupying a similar status or performing similar functions), in any capacity which involves: (i) The solicitation of a client's or prospective client's discretionary account, or (ii) the supervision of any person or persons so engaged; and
- (5) A leverage transaction merchant as a partner, officer, employee, consultant, or agent (or any natural person occupying a similar status or performing similar functions), in any capacity which involves: (i) The solicitation or acceptance of leverage customers' orders (other than in a clerical capacity) for leverage

CFTC (US Federal Agency)

5 Star Linked Data



FINRA (US Self-Regulatory Organization)

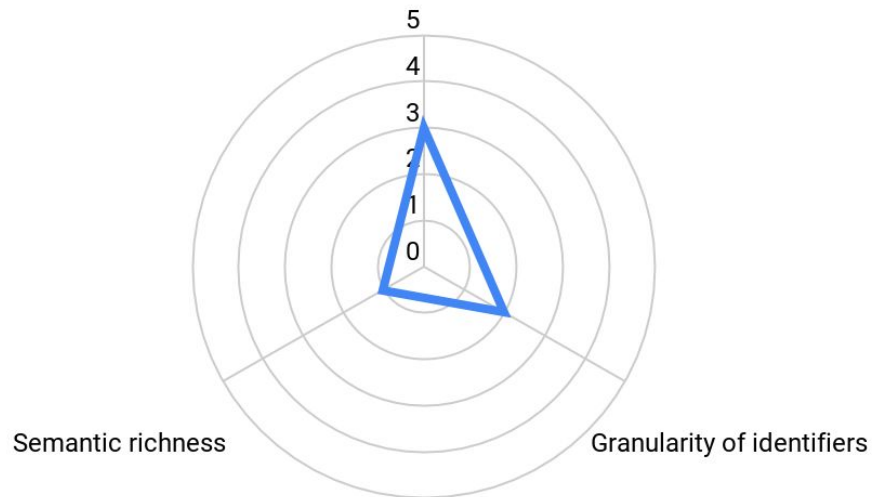
The screenshot shows the FINRA website interface. At the top, there's a navigation bar with links for 'About FINRA', 'Newsroom', 'Compliance Tools', 'Contact', and 'Firm Gateway'. Below this is a search bar and a main navigation menu with categories like 'Industry Home', 'Oversight', 'Rules & Guidance', 'Registration & Qualification', 'Regulatory Filing & Reporting', 'Education & Training', and 'Key Topics'. The main content area is titled 'FINRA Manual: Contents' and lists various sections. A callout box points to a specific rule page, '2111. Suitability', which contains detailed text about investment suitability for institutional accounts. The page includes sections for 'General Principles', 'Disclaimers', and 'Recommended Strategies'.

URIs for individual documents, also available in the form of <https://www.finra.org/finramanual/rules/r2111/>

No links to thesaurus for concept definitions

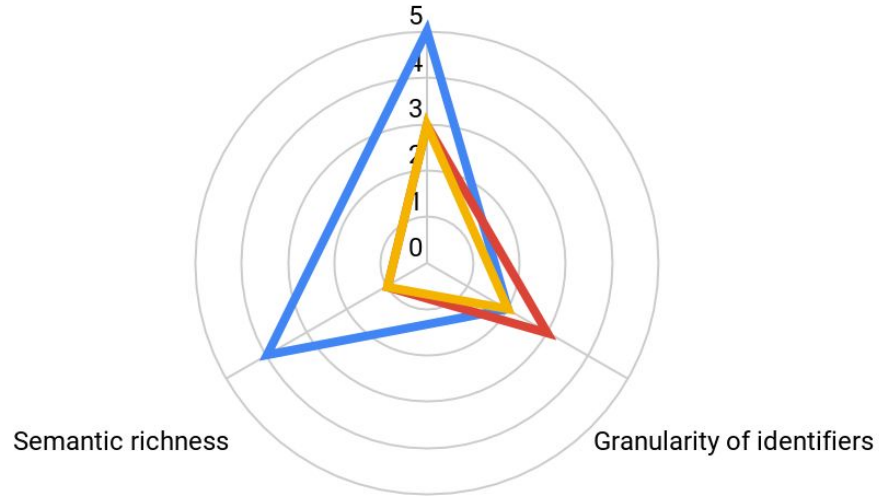
FINRA (US Self-Regulatory Organization)

5 Star Linked Data



Tool to Drive Change

5 Star Linked Data



— ESMA — CFTC — FINRA

Q&A

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